보건학 석사학위논문

Effects of Education and Training on Self-efficacy for Performing CPR Considering Demographic Variables

인구학적 변수를 고려한
심폐소생술 교육 및 실습 경험이
시행능력에 미치는 영향

2015년 8월

서울대학교 보건대학원
보건학과 보건학전공
윤 원 정

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이 논문을 보건학 석사학위논문으로 제출함

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ABSTRACT

Effects of Education and Training on Self-efficacy for Performing CPR Considering Demographic Variables

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Introduction : In Korea, annual incidence of cardiac arrest had been increased steadily every year. But among the cardiac arrest patients, the survival rate was only ~4.4% and the rates of bystander CPR is just 6.5% in 2012. Likewise, the cardiac arrest is a major issue of public health and emergency medicine in Korea. To improve the CPR performing rate, the education and training of CPR for public is necessary. The objective of this study is suggesting effective strategies for customized CPR education and leading to improvement of CPR self-efficacy of the public and finding out the vulnerable groups of

each CPR related characteristics from determining the limiting demographic factors for CPR self-efficacy.

Methods : Data were obtained from the Community Health Survey (CHS) performed in 2012. The participants are adults above 19 years old who lived in national 17th cities and final sample size is 214,190. The analysis is proceeded with four survey items related to the CPR contains recognition, education, training and self-efficacy. For analysis, frequency analysis, Chi-square test and logistic regression analysis were mainly used. Especially, mediation analysis is performed to demonstrated the effects of CPR self-efficacy on demographics.

Results : The CPR educated group has strong self-efficacy (OR=8.52, 95% CI=8.18-8.88) and training experienced group are associated with higher self-efficacy (OR=4.09, 95% CI=3.78-4.44). By demographic characteristics, Female, older, low educated, low income, unemployed or manual workers and housewives, city residents and married people have lower self-efficacy.

Conclusion : For improving the self-efficacy as outcomes, increasing the awareness of importance of CPR, distributing the customized education program broadly and providing manikin training requisitely with education program is required.

Keyword : CPR, Resuscitation, Cardiac arrest, Self-efficacy
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CHAPTER 1 INTRODUCTION

1.1 Background

The cardiac arrest is the sudden loss of cardiac function. It causes the brain damages or even to death, when the condition lasts long. In Korea, annual incidence of cardiac arrest had been increased steadily every year. The number of patients was increased from 19,480 to 27,823 for 6 years between 2006 and 2012 [1]. For this reasons, the cardiac arrest is health problem of public health and emergency medicine in Korea.

Among the cardiac arrest patients, the survival rate was only ~4.4%. This value is remarkably lower compared to western countries (15-18%) [1-2]. There are several related factors with survival from cardiac arrest. Especially, rapid bystander cardiopulmonary resuscitation (CPR) is essential and it determines prognosis and outcomes of cardiac arrest patients [3].

Cardiopulmonary resuscitation (CPR) is defined as restoration of cardiac output and pulmonary ventilation by artificial respiration and closed-chest massage after cardiac arrest [5]. The CPR is provided to patients in 4 minutes that also called golden hour, the probability of survivals is increase about 2-3 times [3]. However, the time more than 4 minutes should be spent to paramedics for their

arrival at the place. This implies that the patient requires the CPR performing from bystanders.

Unfortunately, the rates of bystander CPR is about 6.5% in Korea. The value is significantly lower than that of 30-50% in emergency medical developed countries [1,4]. The rates of bystander CPR are 31.0% in Japan, 40.3% in Norway, 41.0% in United State and 77.0% in Sweden. In comparison with the global average rates (32.0%), Korea have the poor rates of CPR performing [6].

To improve the CPR performing rate, the education and training of CPR for public are indispensable. However, under the current law in Korea, completion of CPR education is not legal obligation. This circumstance compared with that in the above stated countries such as Japan, Norway, United State and Sweden enforcing the legal remedy for CPR education [1]. In Korea, 97% of people recognize the needs of CPR education, but willingness and actual practice rates are only 60% and 38.1% for each [1]. Also, people receiving CPR education in company with manikin training are just 59.8% [1]. This trend aggravates the CPR performing rates as 3.1% (2010) [1]. Therefore, this study have an intention of suggesting effective strategies for customized CPR education by demographic characteristics and leading to improvement of CPR self-efficacy of the public. We anticipated that the findings of study contributed to increasing survival rates of cardiac arrest patients.

Cardiac arrest enable to occur at anytime, anywhere, and anyone. It could be interpreted into that major bystander are more likely to being general public. However, the previous studies dealing with CPR are mostly focused on specified professionals group such as medical personnel and conducted in limited region. Thus, this study presents the value of the populace and nationwide scale results taking the circumstances of cardiac arrest into consideration.

Additionally, the outcome variable in this study is not just CPR performing in clinical situation but 'Self-efficacy' for CPR performance of general public. Self-efficacy is defined as beliefs about capabilities of performing specific behaviors (CPR performance in this study) in particular situations (incidence of cardiac arrest in this study) [7]. Until now, numerous research about CPR self-efficacy are published and most of them detects that self-efficacy increases significantly after CPR education or training [8-15].

In particular, the study purports to finds out the vulnerable groups of each CPR related characteristics from determining the limiting demographic factors for CPR self-efficacy. In exploring this objects, demographic characteristics acts as both control variables and independents variables simultaneously.

1.2 Objectives

The main objective of this study is to suggest effective strategies for CPR education targeting vulnerable group and to improve capability for CPR performing over a nationwide scale. It ultimately leads to increased survival rates of cardiac arrest patients. Specific objectives are as follows:

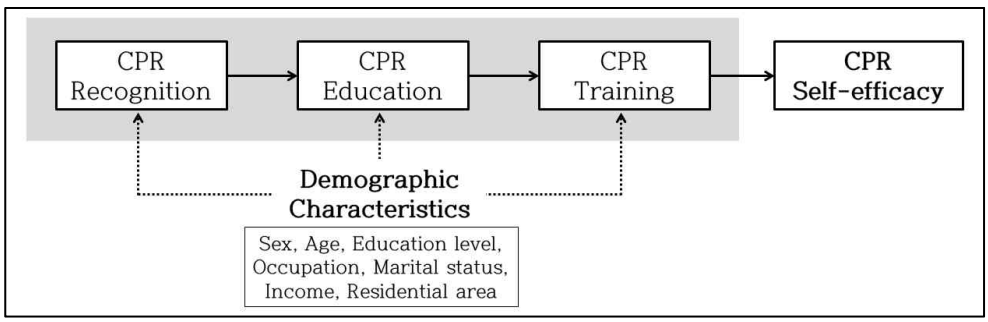
Firstly, investigating rates of CPR recognition, experiences of education and training, and self-efficacy considering demographic characteristics.

Secondly, interpreting the relationship between the CPR self-efficacy and the preliminary variables (i.e., recognition, education experiences and training experiences) as mediators.

Thirdly, determining the limiting factors for CPR self-efficacy based on demographic characteristics.

CHAPTER 2 METHODS

2.1 Study design



<Figure 1. Study design>

Figure 1 structurally illustrates a study design with questionnaires items related to CPR. The sequential preliminary variables consist of recognition, education experience, and training experience for CPR and the final outcome is CPR self-efficacy. Here, the preliminary variables act as mediators on association between demographics variables and CPR self-efficacy. Resulting hypotheses extracted by this study were as follows:

Hypothesis 1. The gradual increasement of rates of recognition and education and training for CPR improves CPR self-efficacy.
Hypothesis 2. There is a difference in the rates of recognition, education and training for CPR by demographic characteristics.
Hypothesis 3. Demographic characteristics affects CPR self-efficacy.

2.2 Data sources

Data were obtained from the Community Health Survey (CHS) which was performed in 2012. It was national cross-sectional survey which was leaded by Korea Centers for Disease Control and Prevention (CDC) under the Ministry of Health and Welfare. This kind of survey is annually performed in between August and October by an unit of a national health center. The participants for survey are ranged by adults above 19 years old who lived in national 17th cities. The samples of 228,921 for this study are randomly extracted from the survey. The analysis is proceeded with a survey containing four questions related to the CPR, which is investigated by the CHS for every four years. The final samples of 214,190 were selected excepting non-response or missing data filtered through the data cleaning.

2.3 Variables

2.3.1 Demographic factors

Demographic variables in this study contain sex, age, education level, occupation, marital status, income. A residential area is included as a community level variable. All of them were re-coded into categorical variables for statistical analysis.

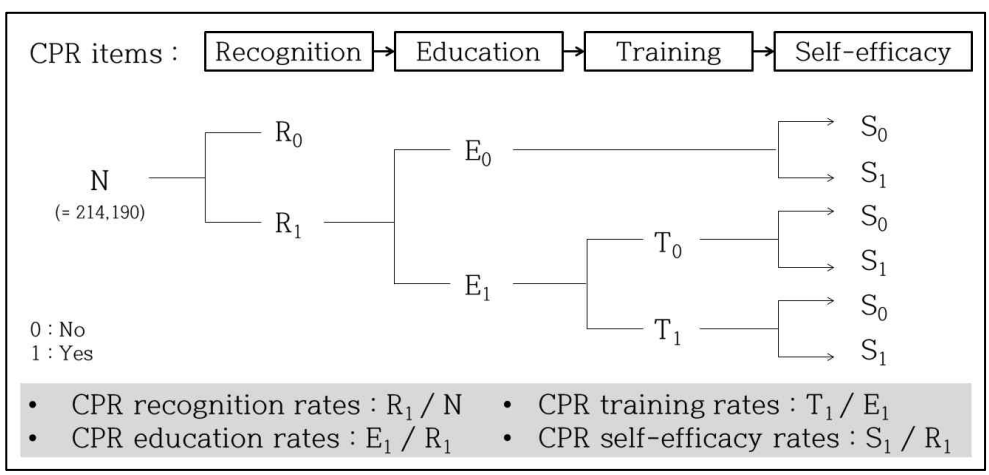
The age was categorized by representative four groups as an young group, an early-middle group, a late-middle group, and an elderly group, which were ranged by ages of 19-34, 35-49, 50-64, and above 65, for each, by a life cycle with an interval of ~15 years.

The education levels were divided into a less than a elementary school, a middle school, a high school and more than a college. Especially, occupation was subdivided into eight groups such as an expertise, an administrative or clerical worker, a sales or service worker, a manual worker, a soldier, a student, a housewife and an unemployed person, considering CPR education accessibility. A expertise group includes an emergency technician, and a medical personnel who were specialized in the CPR. A manual group includes a craft worker, an operator, an agricultural worker, and an elementary worker.

A marital status was classified into three groups of single, married and others containing divorced, separated, widowed. A household income was recalculated into an individual income based on OECD equivalence scale (0.5). The monthly individual income was classified into four quartile groups of the lowest (below 72), the medium lowest (73-144), the medium highest (145-224), and the highest (225 or above), where an unit is ten-thousand Korean Won.

The residential area divided into three categories according to urbanization level. The metropolitan areas represents ‘dong’ region in metropolitan cities such as Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan and the urban areas refers to ‘dong’ region in other small cities. The rural areas means ‘eup/myeon’ region in regardless of cities [15,16].

2.3.2 CPR related factors



<Figure 2. Flow chart of CPR-related variables>

The questionnaire items in part of cardiac arrest are consists of 4 questions in the series CPR recognition, CPR education experience, CPR training experiences and CPR performing ability. In this study, CPR performing ability translated as CPR self-efficacy for emphasizing self-judgement. Figure 2 presents a flow chart and the formula for rates of CPR related variables on the basis of the CHS.

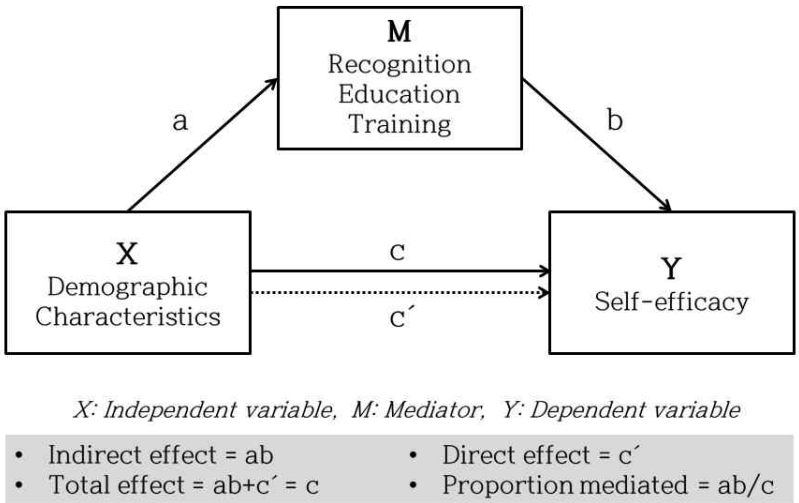
The recognition rates for CPR defines as rates of person that ever seen or heard about CPR among total respondents. The education rates for CPR defines as rates of person that received an education program of CPR in 2 years, among the CPR-recognized person. The training rates for CPR defines as rates of person that practice CPR skills with manikin from education program.

The answer types of CPR performing ability were correctly possible, roughly possible and impossible. It interpreted to three level of CPR self-efficacy as high, low and absence. Among these, high and low level of self-efficacy were combined to having self-efficacy group and it refers to CPR performing rates.

2.4 Statistical analysis

All analyses were conducted by using SAS program version 9.3. The study analyses were proceeded with hypothetical-deductive method to demonstrate the mediation effects. Frequency analysis, Chi-square test and logistic regression analysis were mainly used in this study for analysis of categorical variables. Frequency analysis was used to summarize the distribution of recognition, education, training and self-efficacy for CPR. Chi-square test was used to identify the relationship between the CPR-related variables and demographic variables as explanatory variables. Logistic regression was used to clarify the factors affected to CPR related variables. Odds ratios (ORs) with 95% confidence intervals (95% CIs) using binary logistic regression models were calculated.

Additionally, comparison to the direct effects and indirect effects of CPR self-efficacy on demographics are analyzed from mediation analysis by Baron&Kenny(1986) [17]. In this paper, we consider the use of the regression coefficient-value (B) and odds ratio scale (ORs) for mediation analysis. Also, false discovery rates (FDR) is calculated for multiple comparison test and the values are significant at 0.05 level. Follows are explanation of the formula and schematic diagram of each step for mediation analysis on the basis of study design.



<Figure 3. Mediation model>

Mediated effects required four conditions as 1) 'a' is significant, 2) 'b' is significant, 3) 'c' is significant, 4) 'c′' is not significant or, 'c′' is significant but 'c-c′' is larger than 0 (same as c>c′). In general, second condition is skipped because verifying the first and third condition elicits the second condition [17-19]. The process of mediation analysis are as following.

Step 1 : Independent variables → Mediators

$$M = i_1 + aX + e_M$$

Step 2 : Independent variables → Dependent variables

$$Y = i_2 + cX + e_Y$$

Step 3 : Independent variables + Mediators → Dependent variables

$$Y = i_3 + c'X + bM + e_Y$$

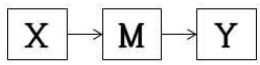
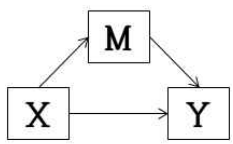
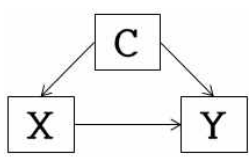
	Model 1 (Step 1)	**Model 2 (Step 2)**	**Model 3 (Step 3)**
	M	Y (Unadjusted)	Y (Adjusted)
X	X→M (a : Indirect effect)	X→Y (c : Total effect)	X→Y (c′ : Direct effect)
M	-	-	M→Y (b : Indirect effect)

<Figure 4. Coefficient values in each step>

In figure 4, Model 1 explain the step 1 that identify the effects of demographics on mediator. Model 2 describe the step 2 that prove the relationship between demographics and outcomes. Lastly, model 3 support the step 3 that association between demographics and outcomes adjusting the mediators. So, coefficient (B) in each model means ‘a’, ‘c’, ‘c′’ and b’ (figure 4).

Essentially, the key contents of inferencing mediated effects is subtraction between c (total effect) in step 2 and c′ (direct effect) in step 3. When total effect is significant but direct effect is non-significant, it means that model have only the indirect effect, that is to say a ‘completely mediated effect’. When both total effect and direct effect is significant but absolute value of coefficient decreases (c>c′) deceases, it indicates that model have both of direct effect and indirect effect, namely the ‘partially mediated effect’ (Table 1). All the rest of cases that didn’t meet the requirements are non-mediated effect [17-19]. As reference, c-c′ means confounder bias in confounding model. [20]

Table 1. Types of relationship

Types	DAGs	Conditions
Completely mediation	 *Only indirect effect*	1) X→M (a) is significant 2) X→Y (c) is significant 3) X,M→Y (c′) is not significant
Partially mediation	 *Both direct and indirect effect*	1) X→M (a) is significant 2) X→Y (c) is significant 3) X,M→Y (c′) is significant 4) Coefficient decreases after adjusting the mediators (c>c′)
Non-mediation	 *Only direct effect*	All the rest cases
Confounding	 *Confounder effects both of X and Y*	1) C→X (a) is significant 2) X→Y (c) is significant 3) X,C→Y (c′) is significant 4) Coefficient not changed after adjusting the confounder (c≒c′)

CHAPTER 3 RESULTS

3.1 General characteristics of study population

Table 2 shows the general demographic characteristics of CPR-recognized people according to CPR self-efficacy level. All subjects of this survey are 214,190 people. Among them, total respondents of CPR self efficacy were 149,444 people because CPR non-recognized group (64,746) were excepted from the question of CPR self-efficacy. In this table, CPR self-efficacy was classified three level as high, low, absence and the number of groups were 12,810 and 59,694 and 77,940 for each level. All demographic variables contains gender, age, education level, occupation, marital status, income, residential areas shown significant association with CPR self-efficacy ($p<.0001$).

In total population, the gender have a similar proportion as 50.0% for each. However, according to the level of CPR self-efficacy, the proportion of gender shows the difference. While the male have greater proportion in high self-efficacy group, the female have bigger proportion in absent self-efficacy group. As the other demographic characteristics, early middle-aged group, graduated over the high school, married people were the majority regardless of self-efficacy level.

Table 2. General characteristics of subjects by CPR self-efficacy level

	CPR Self-efficacy								
	Total (n=149,444)		High (n=12,810)		Low (n=59,694)		Absence (n=77,940)		p-value
	N	(%)	N	(%)	N	(%)	N	(%)	
Gender									
Male	74776	(50.0)	9647	(75.3)	37335	(63.6)	27794	(35.7)	<.0001
Female	74668	(50.0)	3163	(24.7)	21359	(36.4)	50146	(64.3)	
Age group (years)									
Young (19-34)	36773	(24.6)	4479	(35.0)	15702	(26.8)	16592	(21.3)	<.0001
Early middle (35-49)	55371	(37.1)	4685	(36.6)	23455	(40.0)	27231	(34.9)	
Late middle (50-64)	42571	(28.5)	3119	(24.4)	15632	(26.6)	23820	(30.6)	
Elderly (≥65)	14729	(9.9)	527	(4.1)	3905	(6.7)	10297	(13.2)	
Education level									
≤Elementary	15717	(10.5)	467	(3.7)	3833	(6.5)	11417	(14.7)	<.0001
Middle	15883	(10.6)	841	(6.6)	5132	(8.7)	9910	(12.7)	
High	63427	(42.4)	5554	(43.4)	25648	(43.7)	32225	(41.4)	
≥College	54417	(36.4)	5948	(46.4)	24081	(41.0)	24388	(31.3)	
Occupation									
Professional	17733	(11.9)	2548	(19.9)	8144	(13.9)	7041	(9.0)	<.0001
Admin/Clerical	20287	(13.6)	1863	(14.5)	9292	(15.8)	9132	(11.7)	
Sales/Service	22804	(15.3)	2034	(15.9)	8890	(15.2)	11880	(15.2)	
Manual[1)]	43127	(28.9)	3483	(27.2)	18204	(31.0)	21440	(27.5)	
Soldier	838	(0.6)	385	(3.0)	379	(0.7)	74	(0.1)	
Student	6526	(4.4)	941	(7.4)	2792	(4.8)	2793	(3.6)	
Housewife	25886	(17.3)	690	(5.4)	6737	(11.5)	18459	(23.7)	
Unemployed	12243	(8.2)	866	(6.8)	4256	(7.3)	7121	(9.1)	
Marital status									
Single	27976	(18.7)	3531	(27.6)	12358	(21.1)	12087	(15.5)	<.0001
Married	107987	(72.3)	8490	(66.3)	42039	(71.6)	57458	(73.7)	
Others[2)]	13481	(9.0)	789	(6.2)	4297	(7.3)	8395	(10.8)	
Income[3)]									
Quartile Ⅰ	20425	(13.7)	1208	(9.4)	6724	(11.5)	12493	(16.0)	<.0001
Quartile Ⅱ	39609	(26.5)	3025	(23.6)	14974	(25.5)	21610	(27.7)	
Quartile Ⅲ	43502	(29.1)	3816	(29.8)	17610	(30.0)	22076	(28.3)	
Quartile Ⅳ	45908	(30.7)	4761	(37.2)	19386	(33.0)	21761	(27.9)	
Residential areas									
Metropolitan area	48776	(32.6)	3929	(30.7)	19311	(32.9)	25536	(32.8)	<.0001
Urban area	48011	(32.1)	4117	(32.1)	19261	(32.8)	24633	(31.6)	
Rural area	52657	(35.2)	4764	(37.2)	20122	(34.3)	27771	(35.6)	

CPR: cardiopulmonary resuscitation

1) A manual group includes a craft worker, an operator, an agricultural worker, and an elementary worker.

2) Others of marital status containing divorced, separated, widowed.

3) 'Incomes' means the monthly individual income (unit is ten-thousand Korean Won).
Quartile Ⅰ: the lowest (below 72)
Quartile Ⅱ: the medium lowest (73-144)
Quartile Ⅲ: the medium highest (145-224)
Quartile Ⅳ: the highest (225 or above)

Table 3 shows distribution of CPR self-efficacy by the sequential preliminary variables for CPR performing included recognition, education and training experience. In the total population, 149,444 people known about CPR and 71,504(47.8%) people have the self-efficacy among them. Only 25082 people experienced CPR education and 22,003(87.7%) people in this group answered that they can performing CPR. Also, 19,168 people experienced CPR training in CPR education courses. Among them, 17,625(92%) people have the self-efficacy for CPR performance. Likewise, CPR self-efficacy presence rates are increasing through recognition, education, training.

In addition, it displays the association between CPR self-efficacy and experience of education and training in table 3. Both of them were statistically significant (p<.0001). The CPR educated group has strong self-efficacy (OR=10.81, 95% CI=10.39-11.24) and training experienced group are associated with higher self-efficacy (OR=4.01, 95% CI=3.71-4.33).

Table 3. Distribution of rates of CPR self-efficacy by the preliminary variables (recognition, education, training) for performing CPR

	CPR Self-efficacy				
	Total	Presence rates*		Crude OR(95% CI)	p-value
	N	N	(%)		
Total	214190	71504	(33.4)		
CPR Recognition	149444	71504	(47.8)	-	-
CPR Education	25082	22003	(87.7)	10.81(10.39-11.24)	<.0001
CPR Training	19168	17625	(92.0)	4.01(3.71-4.33)	<.0001

* Presence rates of CPR self-efficacy means combining high and low level of self-efficacy group.

3.2 Relationship between demographic characteristics and mediators (recognition, education, training of CPR)

The association between demographic characteristics and CPR recognition is demonstrated in table 4. All demographic variables are significant associated with CPR recognition. As gender, male recognized CPR was 1.8 times (OR=1.81, 95% CI=1.75-1.86) more than female group. By age group, elderly group is lower than other age groups. And recognition rates are increased as education level was higher. In occupation, especially soldier group have higher recognition rates than the other occupation groups (OR=6.43, 95% CI=3.78-10.94) and a manual group (OR=1.25, 95% CI=1.20-1.30) and housewives (OR=1.49, 95% CI=1.42-1.56) have low rates of recognition. As marital status, other group that excepted single and married has lowest recognition rates. Also, individual monthly income have positive relationship with recognition rates. As income is higher, recognition rates of the group increased. By residential areas, urbanization level is higher, recognition rates is also greater.

From the above results, vulnerable group of CPR recognition is female, older, low educated, low income, unemployed or elementary workers or housewives, rural area residents and others marital status contains divorced, separated, widowed.

Table 4. Relationship between demographic variables and CPR recognition

	CPR Recognition (n=214,190)						
	N	(%)	B	S.E.	OR(95% CI)	p	FDR[1)]
Total	149444	(69.8)					
Gender							
Male	74776	(77.4)	0.591	0.016	1.81(1.75-1.86)	***	***
Female	74668	(63.5)			REF		
Age group(years)							
Young(19-34)	36773	(92.6)	1.479	0.032	4.39(4.12-4.68)	***	***
Early middle(35-49)	55371	(90.6)	1.527	0.022	4.60(4.40-4.81)	***	***
Late middle(50-64)	42571	(71.4)	1.161	0.017	3.19(3.09-3.30)	***	***
Elderly(≥65)	14729	(27.4)			REF		
Education level							
≤Elementary	15717	(26.5)			REF		
Middle	15883	(66.1)	0.964	0.018	2.62(2.53-2.72)	***	***
High	63427	(87.5)	1.698	0.019	5.46(5.27-5.66)	***	***
≥College	54417	(93.4)	2.079	0.026	8.00(7.60-8.42)	***	***
Occupation							
Professional	17733	(94.2)	0.753	0.039	2.12(1.97-2.29)	***	***
Admin/Clerical	20287	(93.4)	0.576	0.035	1.78(1.66-1.90)	***	***
Sales/Service	22804	(84.1)	0.600	0.027	1.82(1.73-1.92)	***	***
Manual	43127	(62.5)	0.223	0.020	1.25(1.20-1.30)	***	***
Soldier	838	(98.4)	1.862	0.271	6.43(3.78-10.94)	***	***
Student	6526	(93.9)	0.821	0.059	2.27(2.02-2.55)	***	***
Housewife	25886	(61.1)	0.398	0.024	1.49(1.42-1.56)	***	***
Unemployed	12243	(44.7)			REF		
Marital status							
Single	27976	(91.4)	0.236	0.034	1.27(1.18-1.35)	***	***
Married	107987	(72.2)	0.251	0.017	1.29(1.24-1.33)	***	***
Others	13481	(39.5)			REF		
Income							
Quartile Ⅰ	20425	(38.0)			REF		
Quartile Ⅱ	39609	(71.3)	0.342	0.017	1.41(1.36-1.46)	***	***
Quartile Ⅲ	43502	(83.0)	0.448	0.019	1.57(1.51-1.62)	***	***
Quartile Ⅳ	45908	(87.5)	0.501	0.021	1.65(1.58-1.72)	***	***
Residential areas							
Metropolitan area	48776	(81.7)	0.525	0.016	1.69(1.64-1.75)	***	***
Urban area	48011	(79.5)	0.291	0.016	1.34(1.30-1.38)	***	***
Rural area	52657	(56.0)			REF		

1) FDR (Fulse Discovery Rates) is calculated for multiple comparison test

***p<.001 **p<.01 *p<.05 †p<.10

***FDR<.001 **FDR<.01 *FDR<.05

The association between demographic characteristics and CPR education as mediators is presented in table 5. This results demonstrated the step 1 in mediation analysis. For mediation analysis, regression coefficient-value(B) also calculated from the logistic regression model.

All demographic variables have statistically significant with CPR education. As gender, male educated CPR was 2.4 times (OR=2.41, 95% CI=2.33-2.50) more than female group. By age group, as younger group is more experienced education. And education rates is positively associated with education level. In occupation, soldier group have higher education rates than the other occupation groups (OR=8.64, 95% CI=7.32-10.18). Especially, housewives (OR=0.92, 95% CI=0.84-1.00) have lower education rates than that of unemployed group. As marital status, only single group significantly associated with education rates (OR=1.16, 95% CI=1.08-1.26). Also, individual monthly income have positive relationship with recognition rates. Approximately, as income is higher, education rates of the group increased. As residential areas, there are different trend with recognition. Urbanization level is higher, recognition rates is decreased.

According to above results, female, older, low educated, low income, unemployed and housewives, city residents and non-single person have relatively lower CPR education rates.

Table 5. Relationship between demographic variables and CPR education

	CPR Education (n=149,444)						
	N	(%)	B	S.E.	OR(95% CI)	p	FDR
Total	25082	(16.8)					
Gender							
Male	16941	(22.7)	0.881	0.017	2.41(2.33-2.50)	***	***
Female	8141	(11.0)			REF		
Age group(years)							
Young(19-34)	11284	(30.7)	2.168	0.055	8.74(7.84-9.74)	***	***
Early middle(35-49)	9009	(16.3)	1.421	0.053	4.14(3.73-4.60)	***	***
Late middle(50-64)	4335	(10.2)	1.060	0.052	2.89(2.60-3.20)	***	***
Elderly(≥65)	454	(3.1)			REF		
Education level							
≤Elementary	787	(5.0)			REF		
Middle	1279	(8.1)	0.122	0.048	1.13(1.03-1.24)	*	*
High	10879	(17.2)	0.332	0.042	1.39(1.28-1.51)	***	***
≥College	12137	(22.3)	0.406	0.044	1.50(1.38-1.64)	***	***
Occupation							
Professional	4866	(27.4)	0.858	0.039	2.36(2.19-2.55)	***	***
Admin/Clerical	4564	(22.5)	0.529	0.039	1.70(1.57-1.83)	***	***
Sales/Service	3617	(15.9)	0.427	0.039	1.53(1.42-1.66)	***	***
Manual	6372	(14.8)	0.341	0.037	1.41(1.31-1.51)	***	***
Soldier	581	(69.3)	2.156	0.084	8.64(7.32-10.18)	***	***
Student	2340	(35.9)	0.736	0.044	2.09(1.91-2.28)	***	***
Housewife	1549	(6.0)	-0.087	0.046	0.92(0.84-1.00)	†	†
Unemployed	1193	(9.7)			REF		
Marital status							
Single	8521	(30.5)	0.151	0.039	1.16(1.08-1.26)	***	***
Married	15393	(14.3)	0.061	0.034	1.06(1.00-1.14)	†	†
Others	1168	(8.7)			REF		
Income							
Quartile Ⅰ	1951	(9.6)			REF		
Quartile Ⅱ	5776	(14.6)	0.073	0.030	1.08(1.01-1.14)	*	*
Quartile Ⅲ	7677	(17.7)	0.146	0.030	1.16(1.09-1.23)	***	***
Quartile Ⅳ	9678	(21.1)	0.293	0.030	1.34(1.26-1.42)	***	***
Residential areas							
Metropolitan area	8224	(16.9)	-0.132	0.019	0.88(0.85-0.91)	***	***
Urban area	8688	(18.1)	-0.060	0.019	0.94(0.91-0.98)	**	**
Rural area	8170	(15.5)			REF		

***p<.001 **p<.01 *p<.05 † p<.10

***FDR<.001 **FDR<.01 *FDR<.05

The association between demographic characteristics and CPR training as mediators is shown in table 6. This results also demonstrated the step 1 in mediation analysis. For mediation analysis, regression coefficient-value(B) also calculated from the logistic regression model.

Except for gender and income, all the rest demographic variables have statistically significant with CPR training. The odds ratio of male and female have similar value (OR=1.07, 95% CI=1.00-1.15). Also, monthly income have no significant difference between the quartile groups. By age group, younger group and late-middle-aged group were statistically significant with training rates. In education level, high school graduated have highest ORs, and above college school graduators are followed. As occupation, soldier group have higher training rates than the other occupation groups (OR=2.40, 95% CI=1.77-3.24). Especially, manual workers have lower training rates than unemployed. As marital status, only single group significantly associated with training rates (OR=1.31, 95% CI=1.11-1.54). As residential areas, urbanization level is higher, recognition rates is rather decreased.

In regard to the CPR training, low educated, unemployed and manual workers, city residents and non-single person have weak association.

Table 6. Relationship between demographic variables and CPR training

	CPR Training (n=25,082)						
	N	(%)	B	S.E.	OR(95% CI)	p	FDR
Total	19168	(76.4)					
Gender							
Male	12959	(76.5)	0.069	0.037	1.07(1.00-1.15)	†	†
Female	6209	(76.3)			REF		
Age group(years)							
Young(19-34)	8950	(79.3)	0.278	0.116	1.32(1.05-1.66)	*	*
Early middle(35-49)	6590	(73.2)	0.111	0.112	1.12(0.90-1.39)		
Late middle(50-64)	3326	(76.7)	0.384	0.111	1.47(1.18-1.82)	***	**
Elderly(≥65)	302	(66.5)			REF		
Education level							
≤Elementary	532	(67.6)			REF		
Middle	949	(74.2)	0.296	0.102	1.35(1.10-1.64)	**	**
High	8439	(77.6)	0.409	0.090	1.51(1.26-1.80)	***	***
≥College	9248	(76.2)	0.357	0.094	1.43(1.19-1.72)	***	***
Occupation							
Professional	3755	(77.2)	0.056	0.084	1.06(0.90-1.25)		
Admin/Clerical	3376	(74.0)	-0.126	0.083	0.88(0.75-1.04)		
Sales/Service	2893	(80.0)	0.217	0.085	1.24(1.05-1.47)	*	*
Manual	4580	(71.9)	-0.241	0.079	0.79(0.67-0.92)	**	**
Soldier	519	(89.3)	0.874	0.154	2.40(1.77-3.24)	***	***
Student	1903	(81.3)	0.027	0.093	1.03(0.86-1.23)		
Housewife	1205	(77.8)	0.235	0.102	1.27(1.04-1.54)	*	*
Unemployed	937	(78.5)			REF		
Marital status							
Single	6854	(80.4)	0.269	0.082	1.31(1.11-1.54)	**	**
Married	11451	(74.4)	0.003	0.072	1.00(0.87-1.15)		
Others	863	(73.9)			REF		
Income							
Quartile Ⅰ	1489	(76.3)			REF		
Quartile Ⅱ	4363	(75.5)	-0.039	0.064	0.96(0.85-1.09)		
Quartile Ⅲ	5813	(75.7)	-0.027	0.063	0.97(0.86-1.10)		
Quartile Ⅳ	7503	(77.5)	0.094	0.063	1.10(0.97-1.24)		
Residential areas							
Metropolitan area	6234	(75.8)	-0.193	0.039	0.82(0.76-0.89)	***	***
Urban area	6590	(75.9)	-0.156	0.038	0.86(0.79-0.92)	***	***
Rural area	6344	(77.7)			REF		

***p<.001 **p<.01 *p<.05 † p<.10

***FDR<.001 **FDR<.01 *FDR<.05

3.3 Relationship between demographic characteristics and self-efficacy

The association between demographic characteristics and CPR self-efficacy as outcomes is shown in table 7. This results also demonstrated the step 2 in mediation analysis.

All demographic variables are significant associated with CPR self-efficacy. As gender, CPR self-efficacy rates in male group was 3.7 times (OR=3.72, 95% CI=3.62-3.82) more than female group. By age group, as younger group have better CPR self-efficacy. And self-efficacy rates are increased as education level was higher. In occupation, soldier group have highest odds ratio (OR=7.03, 95% CI=5.51-8.98) and housewives have lowest value of odds ratio (OR=1.25, 95% CI=1.18-1.32). As marital status, married group were lower rates of self-efficacy than other group contains divorced, separated, widowed unusually. Individual monthly income is generally not-significant except for highest quartile (OR=1.09, 95% CI=1.05-1.14). As residential areas, urbanization level is higher, self-efficacy rates is rather decreased.

Based on the above results, female, older, low educated, low income, unemployed or manual workers and housewives, city residents and married people have lower self-efficacy than other demographics group.

Table 7. Relationship between demographic variables and CPR self-efficacy

	CPR Self-efficacy (n=149,444)						
	N	(%)	B	S.E.	OR(95% CI)	p	FDR
Gender							
Male	46982	(62.8)	1.313	0.013	3.72(3.62-3.82)	***	***
Female	24522	(32.8)			REF		
Age group(years)							
Young(19-34)	20181	(54.9)	0.814	0.029	2.26(2.13-2.39)	***	***
Early-mid(35-49)	28140	(50.8)	0.681	0.025	1.98(1.88-2.08)	***	***
Late-mid(50-64)	18751	(44.1)	0.574	0.023	1.78(1.70-1.86)	***	***
Elderly(≥65)	4432	(30.1)			REF		
Education level							
≤Elementary	4300	(27.4)			REF		
Middle	5973	(37.6)	0.256	0.026	1.29(1.23-1.36)	***	***
High	31202	(49.2)	0.544	0.023	1.72(1.65-1.80)	***	***
≥College	30029	(55.2)	0.645	0.026	1.91(1.81-2.00)	***	***
Occupation							
Professional	10692	(60.3)	0.713	0.028	2.04(1.93-2.16)	***	***
Admin/Clerical	11155	(55.0)	0.322	0.027	1.38(1.31-1.46)	***	***
Sales/Service	10924	(48.0)	0.411	0.026	1.51(1.43-1.58)	***	***
Manual	21687	(50.3)	0.266	0.024	1.30(1.25-1.37)	***	***
Soldier	764	(91.2)	1.950	0.125	7.03(5.51-8.98)	***	***
Student	3733	(57.2)	0.472	0.037	1.60(1.49-1.72)	***	***
Housewife	7427	(28.7)	0.223	0.028	1.25(1.18-1.32)	***	***
Unemployed	5122	(41.8)			REF		
Marital status							
Single	15889	(56.8)	-0.040	0.028	0.96(0.91-1.02)		
Married	50529	(46.8)	-0.070	0.021	0.93(0.90-0.97)	***	***
Others	5086	(37.7)			REF		
Income							
Quartile Ⅰ	7932	(38.8)			REF		
Quartile Ⅱ	17999	(45.4)	-0.010	0.020	0.99(0.95-1.03)		
Quartile Ⅲ	21426	(49.3)	0.023	0.020	1.02(0.98-1.07)		
Quartile Ⅳ	24147	(52.6)	0.086	0.021	1.09(1.05-1.14)	***	***
Residential areas							
Metropolitan area	23240	(47.7)	-0.079	0.014	0.92(0.90-0.95)	***	***
Urban area	23378	(48.7)	-0.075	0.014	0.93(0.90-0.95)	***	***
Rural area	24886	(47.3)			REF		

***p<.001 **p<.01 *p<.05 † p<.10

***FDR<.001 **FDR<.01 *FDR<.05

3.4 Factors related to CPR self-efficacy considering mediation effects

Table 8 presents the combining results of the logistic regression analysis in chapter 3.2 and 3.3. and the value of odds ratios are extracted from the results representatively. It describe the association between demographic variables and four CPR-related variables in sequence, so we could understand the association trends by demographic variables at one view and compare the each value easily.

CPR self-efficacy is final outcome variables and three of the rest CPR variables (recognition, education, training for CPR) are the process of getting the self-efficacy. Especially, CPR recognition is essential prerequisite for self-efficacy. So, evaluation for mediated effects of CPR recognition on self-efficacy have limits. Also, broadly speaking, CPR training rates are insignificantly different by the groups of demographic characteristics. Accordingly, CPR education is most reliable mediators and it supported from table 3. By demographic variables, gender and age and income are significant in recognition and education. Education level is significant in all three mediators. Occupation is significant in recognition and education except for soldier group. Marital status is significant in recognition and only single group is significant in education and training additionally. Residential area is significant in all mediators, but the direction of association is changed from positive to negative in education stage.

Table 8. Combining the results of the logistic regression analysis

	CPR Recognition		CPR Education		CPR Training		CPR Self-efficacy	
	OR(95% CI)	p	OR(95% CI)	p	OR(95% CI)	p	OR(95% CI)	p
Gender								
Male	1.81(1.75-1.86)	***	2.41(2.33-2.50)	***	1.07(1.00-1.15)	†	3.72(3.62-3.82)	***
Female	REF		REF		REF		REF	
Age group(years)								
Young(19-34)	4.39(4.12-4.68)	***	8.74(7.84-9.74)	***	1.32(1.05-1.66)	*	2.26(2.13-2.39)	***
Early-mid(35-49)	4.60(4.40-4.81)	***	4.14(3.73-4.60)	***	1.12(0.90-1.39)		1.98(1.88-2.08)	***
Late-mid(50-64)	3,19(3.09-3.30)	***	2.89(2.60-3.20)	***	1.47(1.18-1.82)	***	1.78(1.70-1.86)	***
Elderly(≥65)	REF		REF		REF		REF	
Education level								
≤Elementary	REF		REF		REF		REF	
Middle	2.62(2.53-2.72)	***	1.13(1.03-1.24)	*	1.35(1.10-1.64)	**	1.29(1.23-1.36)	***
High	5.46(5.27-5.66)	***	1.39(1.28-1.51)	***	1.51(1.26-1.80)	***	1.72(1.65-1.80)	***
≥College	8.00(7.60-8.42)	***	1.50(1.38-1.64)	***	1.43(1.19-1.72)	***	1.91(1.81-2.00)	***
Occupation								
Professional	2.12(1.97-2.29)	***	2.36(2.19-2.55)	***	1.06(0.90-1.25)		2.04(1.93-2.16)	***
Admin/Clerical	1.78(1.66-1.90)	***	1.70(1.57-1.83)	***	0.88(0.75-1.04)		1.38(1.31-1.46)	***
Sales/Service	1.82(1.73-1.92)	***	1.53(1.42-1.66)	***	1.24(1.05-1.47)	*	1.51(1.43-1.58)	***
Manual	1.25(1.20-1.30)	***	1.41(1.31-1.51)	***	0.79(0.67-0.92)	**	1.30(1.25-1.37)	***
Soldier	6.43(3.78-10.94)	***	8.64(7.32-10.18)	***	2.40(1.77-3.24)	***	7.03(5.51-8.98)	***
Student	2.27(2.02-2.55)	***	2.09(1.91-2.28)	***	1.03(0.86-1.23)		1.60(1.49-1.72)	***
Housewife	1.49(1.42-1.56)	***	0.92(0.84-1.00)	†	1.27(1.04-1.54)	*	1.25(1.18-1.32)	***
Unemployed	REF		REF		REF		REF	
Marital status								
Single	1.27(1.18-1.35)	***	1.16(1.08-1.26)	***	1.31(1.11-1.54)	**	0.96(0.91-1.02)	
Married	1.29(1.24-1.33)	***	1.06(1.00-1.14)	†	1.00(0.87-1.15)		0.93(0.90-0.97)	***
Others	REF		REF		REF		REF	
Income								
Quartile Ⅰ	REF		REF		REF		REF	
Quartile Ⅱ	1.41(1.36-1.46)	***	1.08(1.01-1.14)	*	0.96(0.85-1.09)		0.99(0.95-1.03)	
Quartile Ⅲ	1.57(1.51-1.62)	***	1.16(1.09-1.23)	***	0.97(0.86-1.10)		1.02(0.98-1.07)	
Quartile Ⅳ	1.65(1.58-1.72)	***	1.34(1.26-1.42)	***	1.10(0.97-1.24)		1.09(1.05-1.14)	***
Residential areas								
Metropolitan area	1.69(1.64-1.75)	***	0.88(0.85-0.91)	***	0.82(0.76-0.89)	***	0.92(0.90-0.95)	***
Urban area	1.34(1.30-1.38)	***	0.94(0.91-0.98)	**	0.86(0.79-0.92)	***	0.93(0.90-0.95)	***
Rural area	REF		REF		REF		REF	

***p<.001 **p<.01 *p<.05 † p<.10

Table 9 and 10 demonstrate the step 3 in mediation analysis including the results of the step 1 and 2 (see figure 4). Table 9 identify the factors associated with CPR self-efficacy considering CPR education as mediators. we passed the verification of mediated effects of CPR recognition on CPR self-efficacy because CPR self-efficacy respondents is limited to CPR recognized person, and estimating the mediated effects of CPR recognition on CPR self-efficacy is unavailable.

In model 3 in table 9, CPR education role as mediators is significant (B=2.142, p<.001) with CPR self-efficacy after adjusting demographic variables.

As gender, model 1 shows that male educated CPR was significantly higher than female group and model 2 also have the significant p-value. By comparison the coefficient-value, c(B=1.313) in model 2 is larger than c′(B=1.222) in model 3. So, CPR education have mediated effect into gender. By age group, model 1 presents that as younger group is significantly more experienced education and model 2 shows similar significant trend. Additionally, coefficient-value in model 2 is larger than that of model 3. It demonstrated the mediating effects of education on age. And education rates is positively associated with education level. Self-efficacy also clearly related to education level. Mediation effects of education is available in above the high school graduated. In occupation, all groups have higher education rates than the unemployed except for housewives.

They also have significant results in model 2. So, CPR education's mediated effects are applicable to all the rest occupation group, excluded house wives. As marital status, only single group significantly associated with education rates and only married group have significant value on self-efficacy. Therefore, CPR education not mediated to marital status and self-efficacy. According to income, quartile 4 group only have the meaningful difference with quartile 1 as reference group about the CPR education. It has significant in model 2 and non-significant in model 3, so completely mediated effects exist in quartile 4. As residential areas, urbanization level is higher, rates of the education and self-efficacy is significantly lower against expectation. Comparison the results of model 2 and model 3, education have the mediated effect in the negative(-) direction.

Table 9. Factors related to CPR self-efficacy considering CPR education

	Model 1 : X→M (estimate a)		Model 2 : X→Y (estimate c)		Model 3 : X,M→Y (estimate c´ and b)		
	CPR Education		CPR Self-efficacy		CPR Self-efficacy		
	B	OR(95% CI)	B	OR(95% CI)	B	OR(95% CI)	
Independent							
Gender							
Male	0.881***	2.41(2.33-2.50)	1.313***	3.72(3.62-3.82)	1.222***	3.40(3.30-3.49)	P
Female		REF		REF		REF	
Age group(years)							
Young(19-34)	2.168***	8.74(7.84-9.74)	0.814***	2.26(2.13-2.39)	0.481***	1.62(1.53-1.72)	P
Early-mid(35-49)	1.421***	4.14(3.73-4.60)	0.681***	1.98(1.88-2.08)	0.532***	1.70(1.62-1.79)	P
Late-mid(50-64)	1.060***	2.89(2.60-3.20)	0.574***	1.78(1.70-1.86)	0.480***	1.62(1.54-1.69)	P
Elderly(≥65)		REF		REF		REF	
Education level							
≤Elementary		REF		REF		REF	
Middle	0.122*	1.13(1.03-1.24)	0.256***	1.29(1.23-1.36)	0.259***	1.30(1.23-1.37)	
High	0.332***	1.39(1.28-1.51)	0.544***	1.72(1.65-1.80)	0.538***	1.71(1.64-1.79)	P
≥College	0.406***	1.50(1.38-1.64)	0.645***	1.91(1.81-2.00)	0.633***	1.88(1.79-1.98)	P
Occupation							
Professional	0.858***	2.36(2.19-2.55)	0.713***	2.04(1.93-2.16)	0.511***	1.67(1.57-1.77)	P
Admin/Clerical	0.529***	1.70(1.57-1.83)	0.322***	1.38(1.31-1.46)	0.212***	1.24(1.17-1.31)	P
Sales/Service	0.427***	1.53(1.42-1.66)	0.411***	1.51(1.43-1.58)	0.335***	1.40(1.33-1.48)	P
Manual	0.341***	1.41(1.31-1.51)	0.266***	1.30(1.25-1.37)	0.212***	1.24(1.18-1.30)	P
Soldier	2.156***	8.64(7.32-10.18)	1.950***	7.03(5.51-8.98)	1.215***	3.37(2.61-4.35)	P
Student	0.736***	2.09(1.91-2.28)	0.472***	1.60(1.49-1.72)	0.260***	1.30(1.20-1.40)	P
Housewife	-0.087†	0.92(0.84-1.00)	0.223***	1.25(1.18-1.32)	0.214***	1.24(1.17-1.31)	
Unemployed		REF		REF		REF	
Marital status							
Single	0.151***	1.16(1.08-1.26)	-0.040	0.96(0.91-1.02)	-0.082**	0.92(0.87-0.98)	
Married	0.061†	1.06(1.00-1.14)	-0.070***	0.93(0.90-0.97)	-0.069**	0.93(0.90-0.97)	
Others		REF		REF		REF	
Income							
Quartile Ⅰ		REF		REF		REF	
Quartile Ⅱ	0.073*	1.08(1.01-1.14)	-0.010	0.99(0.95-1.03)	-0.019	0.98(0.94-1.02)	
Quartile Ⅲ	0.146***	1.16(1.09-1.23)	0.023	1.02(0.98-1.07)	0.000	1.00(0.96-1.04)	
Quartile Ⅳ	0.293***	1.34(1.26-1.42)	0.086***	1.09(1.05-1.14)	0.029	1.00(0.99-1.07)	C
Residential areas							
Metropolitan area	-0.132***	0.88(0.85-0.91)	-0.079***	0.92(0.90-0.95)	-0.052***	0.95(0.92-0.98)	P
Urban area	-0.060**	0.94(0.91-0.98)	-0.075***	0.93(0.90-0.95)	-0.065***	0.94(0.91-0.97)	P
Rural area		REF		REF		REF	
Mediator							
CPR education					2.142***	8.52(8.18-8.88)	
CPR training					-	-	

***p<.001 **p<.01 *p<.05 † p<.10

P : Partially mediated effects

C : Completely mediated effects

Table 10 verify the factors associated with CPR self-efficacy considering CPR training as mediators. In model 3 in table 4-3, CPR training act as mediators is significant (B=1.409, p<.001) with CPR self-efficacy after controlling demographic variables.

Male's training rates are similar to female groups so, CPR training not mediated to gender and self-efficacy. By age group, young and late-middled ages group have significant value in model 1 and model 2. In accordance with model 3, CPR training completely mediated in young group and partially mediated in late-middle aged group. As education level, all level have the significant value in model 1 and model 2. In middle school graduated, training act as completely mediators and over the high school graduated, training acts as partially mediators. In occupation, sales/service workers, soldiers, housewives is significant and manual workers is insignificant with CPR training. all groups of occupation have significant in model2. According to model 3, sales/service workers and soldier are partially mediated and housewives are completely mediated with CPR training. Marital status by training shows similar trends with marital status by education. So, CPR training not mediated to marital status and self-efficacy too. According to income, all quartile of income level are not different with each other. That is, income is directly effects on self-efficacy not through the CPR training. As residential areas, urbanization level is higher, rates of the training and self-efficacy is significantly lower. But, comparison the results of model 2 and model 3, training not mediated demographics and self-efficacy.

Table 10. Factors related to CPR self-efficacy considering CPR training

	Model 1 : X→M (estimate a)		Model 2 : X→Y (estimate c)		Model 3 : X,M→Y (estimate c′ and b)		
	CPR Training		CPR Self-efficacy		CPR Self-efficacy		
	B	OR(95% CI)	B	OR(95% CI)	B	OR(95% CI)	
Independent							
Gender							
Male	0.069†	1.07(1.00-1.15)	1.313***	3.72(3.62-3.82)	0.966***	2.63(2.40-2.88)	
Female		REF		REF		REF	
Age group(years)							
Young(19-34)	0.278*	1.32(1.05-1.66)	0.814***	2.26(2.13-2.39)	0.044	1.04(0.78-1.40)	C
Early-mid(35-49)	0.111	1.12(0.90-1.39)	0.681***	1.98(1.88-2.08)	0.194	1.22(0.92-1.61)	
Late-mid(50-64)	0.384***	1.47(1.18-1.82)	0.574***	1.78(1.70-1.86)	0.556***	1.74(1.32-2.30)	P
Elderly(≥65)		REF		REF		REF	
Education level							
≤Elementary		REF		REF		REF	
Middle	0.296**	1.35(1.10-1.64)	0.256***	1.29(1.23-1.36)	0.161	1.17(0.90-1.53)	C
High	0.409***	1.51(1.26-1.80)	0.544***	1.72(1.65-1.80)	0.316**	1.37(1.09-1.73)	P
≥College	0.357***	1.43(1.19-1.72)	0.645***	1.91(1.81-2.00)	0.298*	1.35(1.06-1.72)	P
Occupation							
Professional	0.056	1.06(0.90-1.25)	0.713***	2.04(1.93-2.16)	0.499***	1.65(1.33-2.04)	
Admin/Clerical	-0.126	0.88(0.75-1.04)	0.322***	1.38(1.31-1.46)	0.117	1.12(0.91-1.39)	
Sales/Service	0.217*	1.24(1.05-1.47)	0.411***	1.51(1.43-1.58)	0.259*	1.30(1.05-1.60)	P
Manual	-0.241**	0.79(0.67-0.92)	0.266***	1.30(1.25-1.37)	0.220*	1.25(1.02-1.53)	
Soldier	0.874***	2.40(1.77-3.24)	1.950***	7.03(5.51-8.98)	1.261***	3.53(2.10-5.95)	P
Student	0.027	1.03(0.86-1.23)	0.472***	1.60(1.49-1.72)	0.351**	1.42(1.13-1.79)	
Housewife	0.235*	1.27(1.04-1.54)	0.223***	1.25(1.18-1.32)	0.066	1.07(0.84-1.36)	C
Unemployed		REF		REF		REF	
Marital status							
Single	0.269**	1.31(1.11-1.54)	-0.040	0.96(0.91-1.02)	0.022	1.02(0.83-1.26)	
Married	0.003	1.00(0.87-1.15)	-0.070***	0.93(0.90-0.97)	-0.007	0.99(0.83-1.26)	
Others		REF		REF		REF	
Income							
Quartile Ⅰ		REF		REF		REF	
Quartile Ⅱ	-0.039	0.96(0.85-1.09)	-0.010	0.99(0.95-1.03)	-0.048	0.95(0.81-1.13)	
Quartile Ⅲ	-0.027	0.97(0.86-1.10)	0.023	1.02(0.98-1.07)	-0.076	0.93(0.79-1.09)	
Quartile Ⅳ	0.094	1.10(0.97-1.24)	0.086***	1.09(1.05-1.14)	-0.006	0.99(0.84-1.17)	
Residential areas							
Metropolitan area	-0.193***	0.82(0.76-0.89)	-0.079***	0.92(0.90-0.95)	-0.255***	0.78(0.70-0.86)	
Urban area	-0.156***	0.86(0.79-0.92)	-0.075***	0.93(0.90-0.95)	-0.141**	0.87(0.79-0.96)	
Rural area		REF		REF		REF	
Mediator							
CPR education					-	-	
CPR training					1.409***	4.09(3.78-4.44)	

***p<.001 **p<.01 *p<.05 † p<.10

P : Partially mediated effects

C : Completely mediated effects

CHAPTER 4 DISCUSSION AND CONCLUSIONS

4.1 Discussion

The purpose of this study is to suggest effective strategies for CPR education targeting each vulnerable groups and to improve self-efficacy for CPR performing over a nationwide scale. Main discussion points is presented by the series of the objectives as 1) investigating rates of CPR recognition, education, training, and self-efficacy 2) interpreting the relationship between the CPR self-efficacy and the preliminary variables as mediators 3) determining the limiting factors for CPR self-efficacy based on demographics.

The rates of CPR recognition by definition is 69.8%. Among the recognized-person, CPR education rates is 16.8% and when dominator is total subjects, the education rates is 11.7%. CPR training rates according to definition is 76.4% and its value is 9.0% in total population. Lastly, CPR self-efficacy rates is 47.8% among recognized group. It have the value 33.4% among whole respondents, also 8.2% among experienced both of education and training. Synthetically, the gap of rates between CPR recognition and education is largest and most of CPR education group experience the training. Also self-efficacy rates founded on both of education and training is only 8.2% comparing to 47.8% in subjective self-efficacy rates among simple recognized-person.

From the results of logistic regression analysis between CPR self-efficacy and the preliminary variables for performing CPR, unadjusted odds ratio (OR) is 10.81 on education and 4.01 on training (table 3). Odds ratios (OR) adjusted demographic variables are 8.52 and 4.09 on education and training for each (table 9, 10). However, the value of OR for education have the merged effects of education and training. It considered that both of education and training experienced group have larger OR than the only education experienced group (Appendix figure 2). Over all, CPR recognition act as threshold for self-efficacy. CPR education is not only theoretical improvement factor of self-efficacy but also leading factor of the training experiences. Especially, CPR training is practical improvement factor of self-efficacy and most closed to performing ability.

The education strategies targeting vulnerable groups of CPR preliminary variables is effective to improvement CPR self-efficacy and performing rates. The standards of vulnerable group selection is based on frequency, odds ratio and mediated effects of education and training by demographic variables. Generally, the trends of odds ratio by the demographic variables in CPR education is more significant and clear than that in CPR training.

In gender, males have the stronger self-efficacy than female. Female is vulnerable group in recognition and education of CPR and there is not significant difference in training compared to male. CPR self-efficacy of male have the partially mediated by education only.

By age group, as younger group have better CPR self-efficacy. Elderly and late-middle aged group is vulnerable target in recognition and education. All age group have the mediated effects of education in self-efficacy. Especially, younger group have complete mediated effects.

CPR self-efficacy rates are increased as education level was higher. Below the middle school graduated is disadvantaged group in all CPR related factors. The mediated effects of education and training is partially exist in above high school graduated. Particularly, middle school graduated not have mediated effects of education but mediated by training completely.

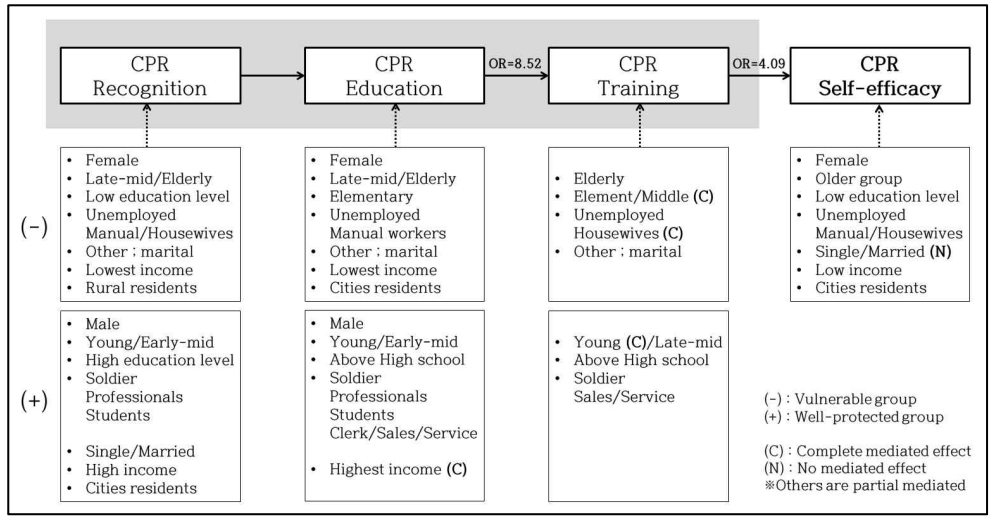
According to occupation, soldier and professionals have higher odds ratio and housewives and unemployed have lower value of odds ratio than rest of the other occupation groups. Housewives, manual workers, unemployed belongs to disadvantaged group. All occupations are affected by education excepting housewives. Instead of that, housewives are completely mediated by training. Soldier, sales and service workers have the partial mediated effects of training.

In regard to marital status, married and single group have lower or similar self-efficacy than other group contains divorced, separated, widowed. The other group is vulnerable group in all three CPR characteristics but married and single group is rather weak groups in self-efficacy.

Individual income (monthly) is generally not-significant except for highest group (Quartile 4). Highest quartile have stronger self-efficacy than the lowest quartile. The lowest group is disadvantage group of recognition and education. In training, there is not difference by income level. Most have not mediated effects, but only quartile 4 mediated by education completely.

As residential areas, urbanization level is higher, self-efficacy is rather decreased contrary to expectations. In terms of recognition, rural area is weak groups but unlikely, cities are vulnerable areas in education and training. Association between residential areas and self-efficacy is partially mediated by education.

In summary, groups that needs to recognize CPR are females, older people, low education level, unemployed, housewives, manual workers, other types of marital status, lowest income level and rural residents. Similarly, groups required to CPR education are female, older people, elementary graduated people, unemployed, manual workers, other types of marital status, lowest income level and cities residents. Additionally, male, younger groups, above the high school graduated, highest income level influenced by education as mediator. In training, gender, income level, residential areas are not different significantly by the groups. Interestingly, younger group and housewives are completely mediated by training to improve self-efficacy. Only marital status is not mediated both of education and training so, it seems to regulating by itself (Figure 5).



<Figure 5. Summary chart>

Figure 5 describe the vulnerable group of each CPR variables considering mediated effects. The well-protected group influenced by each step are also suggested for more improving. In results of occupation, soldier group is most higher than the other groups in every steps and students are relatively higher too. This trends caused by group instruction [21-22]. On the other hand, sales and service workers needs to education by group units for unexpected situations of customer, because their major business is meeting.

Furthermore, highest income group is completely mediated by education and young, low education level, housewives are completely mediated by training. Interestingly, low education level and housewives is non-mediated by education and it means that they depends on training absolutely and not have the education effects.

Lastly, marital status and residential area have unusual trend. single and married group are more recognized and educated, trained but their self-efficacy is rather lower than the other group. It is interpreted that recognition not affected to self-efficacy and single and married group have lower self-efficacy regardless of education and training experiences [23]. It seems that they have an another potential risk factors. City residents are more recognized but less educated and trained. Also, self-efficacy is lower than rural area residents. It is trends contrary to previous studies [24]. However, low self-efficacy in cities residents and married people or female are problems, because the main place of accidents are areas of high population density or home [1, 21, 25].

Accordingly, the public relations and recommendation of joining the education program is required to non-recognized and un-educated people. Also, vulnerable group of training needs to formal education accompany with manikin training, not just informal process like as television or internet [23].

This study has several limitations. Firstly, CPR self-efficacy as main outcome is not clearly correspond to actual performing ability. Getting self-efficacy for performing CPR is available without the experience of formal education or training of CPR. When self-efficacy interpreted to real performing ability, it could leads to overestimating the performing rates. Secondly, there is impossible group of CPR performing due to unchangeable demographic factors. Like as, elderly

is not strong physically enough for performing CPR on people even though receiving education. Lastly, the mediation analysis applied only between education, training and self-efficacy. For more accurate understanding mediation effects among CPR variables, it should implements every associations cases. Above stated limits are taken into consideration.

4.2 Conclusions

Our findings suggests that the rates of self-efficacy for performing CPR is just 33.4% among whole respondents, and only 8.2% among the educated and trained group. For improving the self-efficacy as outcomes, increasing the awareness of importance of CPR, distributing the customized education program broadly and providing manikin training requisitely with education program is required [6].

Trained-CPR bystander is essential in cardiac arrest situation. To distributing the CPR formal education broadly, providing the service by units of community agencies is effective. Further, community based study is needed for regional-based education program. In this regard, public relations and developments of consistent guide is primary tasks.

APPENDIX

Appendix Table 1. Distribution of rates of the CPR preliminary variables by the level of self-efficacy

	CPR Self-efficacy							
	Total	High (n=12810)		Low (n=59694)		Absence (n=77940)		P-value
	N	N	(%)	N	(%)	N	(%)	
CPR Recognition								
No	64746	0	0.0	0	0.0	0	0.0	-
Yes	149444	12810	100.0	58694	100.0	77940	100.0	
CPR Education								
No	124346	4911	38.3	44590	76.0	74861	96.1	<.0001
Yes	25082	7899	61.7	14104	24.0	3079	4.0	
CPR Training								
No	5914	541	6.9	3837	27.2	1536	49.9	<.0001
Yes	19168	7358	93.2	10267	72.8	1543	50.1	

Appendix Table 2. Relationship between CPR self-efficacy and the level of education and training

Level	CPR Self-efficacy			
Education / Training	Total	N(%)	OR(95% CI)	P-value
No / No	124362	49501(39.8)	REF	
Yes / No	5914	4378(74.0)	3.28(3.08-3.49)	0.0002
Yes / Yes	19168	17625(92.0)	13.81(13.07-14.59)	<.0001

Appendix Table 3. Demographics factors related to CPR self-efficacy considering odds ratios and mediated effects

	CPR Recognition			CPR Education				CPR Training				CPR Self-efficacy		
	N(%)	OR(95% CI)		N(%)	OR(95% CI)			N(%)	OR(95% CI)			N(%)	OR(95% CI)	
Gender														
Male	74776(77.4)	1.81(1.75-1.86)	***	16941(22.7)	2.41(2.33-2.50)	***	P	12959(76.5)	1.07(1.00-1.15)	†		46982(62.8)	3.72(3.62-3.82)	***
Female	74669(63.5)	REF		8141(11.0)	REF			6209(76.3)	REF			24522(32.8)	REF	
Age group(years)														
Young(19-34)	36773(92.6)	4.39(4.12-4.68)	***	11284 (30.7)	8.74(7.84-9.74)	***	P	8950(79.3)	1.32(1.05-1.66)	*	C	20181(54.9)	2.26(2.13-2.39)	***
Early-mid(35-49)	55371(90.6)	4.60(4.40-4.81)	***	9009(16.3)	4.14(3.73-4.60)	***	P	6590(73.2)	1.12(0.90-1.39)			28140(50.8)	1.98(1.88-2.08)	***
Late-mid(50-64)	42571(71.4)	3,19(3.09-3.30)	***	4335(10.2)	2.89(2.60-3.20)	***	P	3326(76.7)	1.47(1.18-1.82)	***	P	18751(44.1)	1.78(1.70-1.86)	***
Elderly(≥65)	14729(27.4)	REF		454(3.1)	REF			302(66.5)	REF			4432(30.1)	REF	
Education level														
≤Elementary	15717(26.5)	REF		787(5.0)	REF			532(67.6)	REF			4300(27.4)	REF	
Middle	15883(66.1)	2.62(2.53-2.72)	***	1279(8.1)	1.13(1.03-1.24)	*		949(74.2)	1.35(1.10-1.64)	**	C	5973(37.6)	1.29(1.23-1.36)	***
High	63427(87.5)	5.46(5.27-5.66)	***	10879(17.2)	1.39(1.28-1.51)	***	P	8439(77.6)	1.51(1.26-1.80)	***	P	31202(49.2)	1.72(1.65-1.80)	***
≥College	54417(93.4)	8.00(7.60-8.42)	***	12137(22.3)	1.50(1.38-1.64)	***	P	9248(76.2)	1.43(1.19-1.72)	***	P	30029(55.2)	1.91(1.81-2.00)	***
Occupation														
Professional	17733(94.2)	2.12(1.97-2.29)	***	4866(27.4)	2.36(2.19-2.55)	***	P	3755(77.2)	1.06(0.90-1.25)			10692(60.3)	2.04(1.93-2.16)	***
Admin/Clerical	20287(93.4)	1.78(1.66-1.90)	***	4564(22.5)	1.70(1.57-1.83)	***	P	3376(74.0)	0.88(0.75-1.04)			11155(55.0)	1.38(1.31-1.46)	***
Sales/Service	22804(84.1)	1.82(1.73-1.92)	***	3617(15.9)	1.53(1.42-1.66)	***	P	2893(80.0)	1.24(1.05-1.47)	*	P	10924(48.0)	1.51(1.43-1.58)	***
Manual	43127(62.5)	1.25(1.20-1.30)	***	6372(14.8)	1.41(1.31-1.51)	***	P	4580(71.9)	0.79(0.67-0.92)	**		21687(50.3)	1.30(1.25-1.37)	***
Soldier	838(98.4)	6.43(3.78-10.94)	***	581(69.3)	8.64(7.32-10.18)	***	P	519(89.3)	2.40(1.77-3.24)	***	P	764(91.2)	7.03(5.51-8.98)	***
Student	6526(93.9)	2.27(2.02-2.55)	***	2340(35.9)	2.09(1.91-2.28)	***	P	1903(81.3)	1.03(0.86-1.23)			3733(57.2)	1.60(1.49-1.72)	***
Housewife	25886(61.1)	1.49(1.42-1.56)	***	1549(6.0)	0.92(0.84-1.00)	†		1205(77.8)	1.27(1.04-1.54)	*	C	7427(28.7)	1.25(1.18-1.32)	***
Unemployed	12243(44.7)	REF		1193(9.7)	REF			937(78.5)	REF			5122(41.8)	REF	
Marital status														
Single	27976(91.4)	1.27(1.18-1.35)	***	8521(30.5)	1.16(1.08-1.26)	***		6854(80.4)	1.31(1.11-1.54)	**		15889(56.8)	0.96(0.91-1.02)	
Married	107987(72.2)	1.29(1.24-1.33)	***	15393(14.3)	1.06(1.00-1.14)	†		11451(74.4)	1.00(0.87-1.15)			50529(46.8)	0.93(0.90-0.97)	***
Others	13481(39.5)	REF		1168(8.7)	REF			863(73.9)	REF			5086(37.7)	REF	
Income														
Quartile Ⅰ	20425(38.0)	REF		1951(9.6)	REF			1489(76.3)	REF			7932(38.8)	REF	
Quartile Ⅱ	39609(71.3)	1.41(1.36-1.46)	***	5776(14.6)	1.08(1.01-1.14)	*		4363(75.5)	0.96(0.85-1.09)			17999(45.4)	0.99(0.95-1.03)	
Quartile Ⅲ	43502(83.0)	1.57(1.51-1.62)	***	7677(17.7)	1.16(1.09-1.23)	***		5813(75.7)	0.97(0.86-1.10)			21426(49.3)	1.02(0.98-1.07)	
Quartile Ⅳ	45908(87.5)	1.65(1.58-1.72)	***	9678(21.1)	1.34(1.26-1.42)	***	C	7503(77.5)	1.10(0.97-1.24)			24147(52.6)	1.09(1.05-1.14)	***
Residential areas														
Metropolitan area	48776(81.7)	1.69(1.64-1.75)	***	8224(16.9)	0.88(0.85-0.91)	***	P	6234(75.8)	0.82(0.76-0.89)	***		23240(47.7)	0.92(0.90-0.95)	***
Urban area	48011(79.5)	1.34(1.30-1.38)	***	8688(18.1)	0.94(0.91-0.98)	**	P	6590(75.9)	0.86(0.79-0.92)	***		23378(48.7)	0.93(0.90-0.95)	***
Rural area	52657(56.0)	REF		8170(15.5)	REF			6344(77.7)	REF			24886(47.3)	REF	

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SUMMARY IN KOREAN

국문초록

인구학적 변수를 고려한 심폐소생술 교육 및 실습 경험이 시행능력에 미치는 영향

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연구배경 : 한국에서 발생하는 연간 심정지 환자의 수는 매년 꾸준히 증가하고 있다. 그러나 이들의 생존율은 4.4%이며, 일반인 심폐소생술 시행률은 6.5%에 그친다. 이처럼 심정지는 보건학 및 응급의학적 관점에서 중요한 문제이며, 이를 해결하기 위해서는 일반인들에게 심폐소생술의 중요성을 인지시키고 시행방법을 교육하는 것이 필요하다. 본 연구의 목적은 인구학적 특성을 중심으로 심폐소생술 인지, 교육, 실습경험 취약집단을 밝혀내고, 이를 통해 효율적인 교육 전략을 제시함으로써 심폐소생술 자기효능감의 범국민적 향상에 기여하고자 하는 것이다.

연구방법 : 본 연구는 2012년 지역사회건강조사 전국 자료를 이용한다. 전국 17개 시·도에 거주하는 19세 이상 성인을 대상으로 한 단면연구로 총 214190명의 자료를 수집하였다. 심폐소생술 관련 심정지 영역의 4문항인 인지여부, 교육경험, 마네킹 실습경험, 자기효능감과 주요 인구학적 변수를 중심으로 분석하였다. 분석방법은 빈도분석, 카이제곱검정, 로지스틱 회귀분석이 주로 이용되었으며, 특히 인구학적 변수들이 심폐소생술 자기효능감에 미치는 직접효과와 간접효과를 비교하기 위해 매개분석을 실시하였다.

연구결과 : 연구결과에 따르면, 심폐소생술 교육경험자는 교육비경험자에 비해 자기효능감이 높았으며 (OR=8.52, 95% CI= 8.18-8.88), 실습경험자도 실습비경험자에 비해 자기효능감이 높았다 (OR=4.09, 95% CI=3.78-4.44). 심폐소생술 자기효능감이 낮은 취약집단은 여성, 노인, 저학력, 저소득층과 무직, 단순노무자 또는 주부, 도시거주민과 기혼자가 해당한다. 이들의 낮은 효능감은 인지, 교육, 실습의 부족에서 기인한다.

결론 : 결과변수인 심폐소생술 자기효능감을 향상시키기 위해서는 심폐소생술의 중요성을 인식시키며, 맞춤형 교육을 널리 배포하고, 특히 마네킹을 이용한 실습이 교육과정에 포함되도록 하는 것이 효과적이다.

주요어 : 심폐소생술, 심정지, 자기효능감
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